1. INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

U.S. Department of Energy (DOE) facilities have performed nuclear energy research and radiochemical production since the early 1940s. The Oak Ridge Reservation (ORR) encompasses 13,974 contiguous hectares (ha) (34,516 acres) owned by the DOE in the Oak Ridge, Tennessee, area. The Y-12 Plant, the East Tennessee Technology Park, and the Oak Ridge National Laboratory (ORNL) are major DOE facilities within the ORR. ORNL was constructed during World War II as a pilot-scale plant to support nuclear energy research and the construction of larger plutonium production facilities at Hanford, Washington. ORNL is located on approximately 1,174 hectares (ha) (2,900 acres), 40 km (25 miles) northwest of the city of Knoxville, in eastern Tennessee (Figure 1-1). The site is located in a water-rich environment that contains numerous small tributaries that flow into the Clinch River located south and west of the site. ORNL is located in the Tennessee Valley between the Great Smoky Mountains (located approximately 80 km or 50 miles east) and the Cumberland Plateau (about 45 km or 25 miles west).

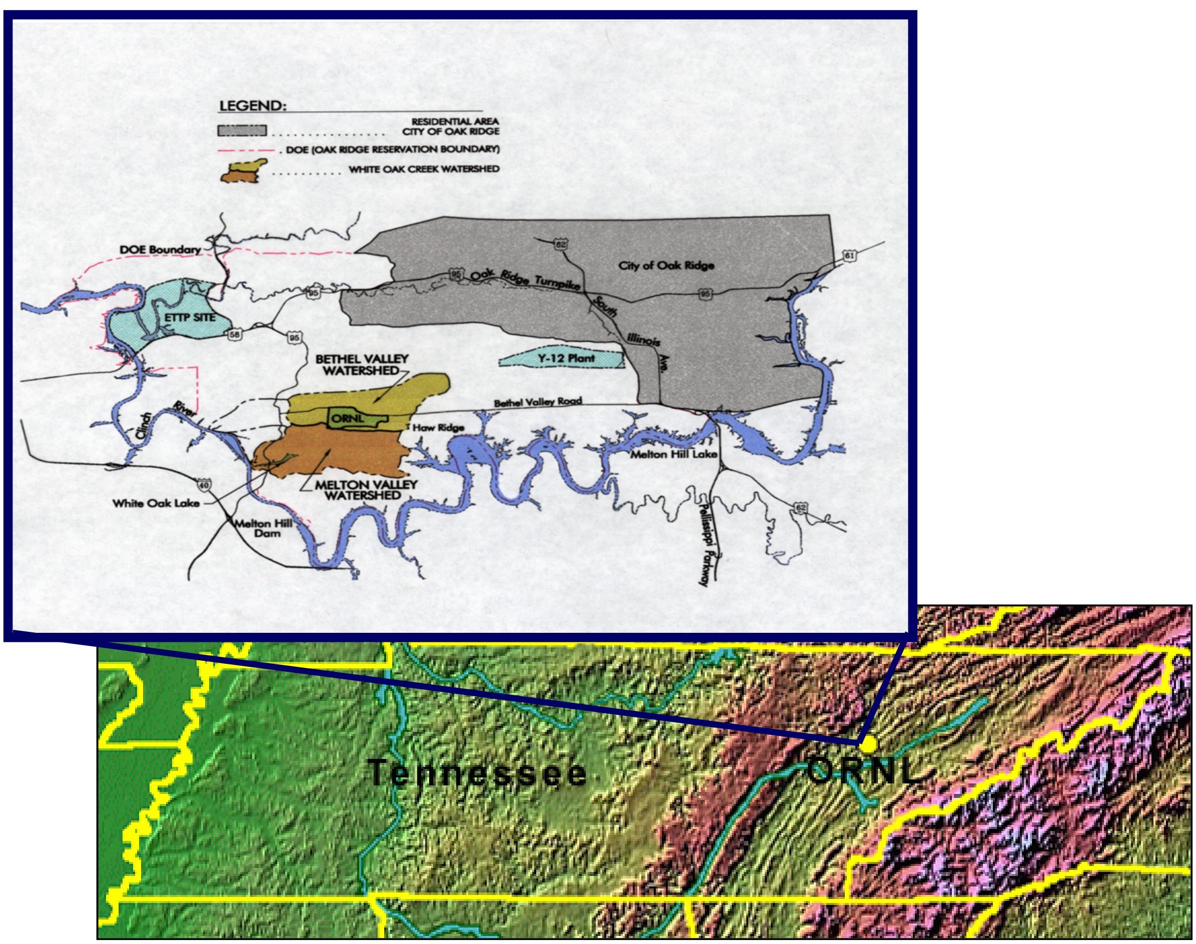

Figure 1-1. Location of Oak Ridge National Laboratory in relation to the City of Oak Ridge, other DOE facilities in the area, and the State of Tennessee.

ORNL continues to be used for DOE operations and is internationally known as a premier research facility. Research and development activities support national defense and energy initiatives. Ongoing waste management and environmental management activities continue to address legacy[1] and newly generated low-level radioactive[2], transuranic (TRU)[3], and hazardous wastes resulting from research and development activities. Meeting the cleanup challenges associated with legacy and newly generated wastes at ORNL is a high priority for the DOE Oak Ridge Operations (ORO), the Tennessee Department of Environment and Conservation (TDEC), and stakeholders. The treatment and disposal of legacy TRU waste at ORNL is an important component of the DOE cleanup at the site. Currently, no facilities exist at ORNL, or the ORR, for treating TRU mixed[4] waste sludges and associated low-level waste supernate, and contact-handled[5] and remote-handled[6] TRU/alpha low-level[7] waste solids, before disposal.

1.2 BACKGROUND

During early research activities, little was known about the effects of exposure to radiation and other hazardous substances. Waste management practices changed as the hazards were better understood. Wastes generated from research and development activities and isotope production were managed with the best available practices at the time. Liquid radioactive waste was stored in underground storage tanks. Lower activity liquid waste was transferred to ponds for storage and settling before release into White Oak Creek. Contaminated solid waste was buried in pits and trenches.

1.2.1 Waste Types

Legacy waste stored at ORNL resulted from past isotope production, and from research and development activities at DOE facilities. The four legacy waste types that would be treated under the proposed action are: remote-handled TRU waste sludge, low-level radioactive waste supernate (liquid portion) associated with the TRU sludge waste, contact-handled TRU/alpha low-level waste solids, and remote-handled TRU/alpha low-level waste solids. Much of the sludge waste contains metals regulated under the Resource Conservation and Recovery Act (RCRA) and, therefore, may be classified as mixed waste. ORNL currently has the largest inventory of remote-handled TRU waste in the DOE complex and a smaller portion of the contact-handled TRU waste.

Supernate, the liquid portion of the waste stored in the underground storage tanks at ORNL, is generally characterized as low-level waste. Sludge waste, found on the bottoms of the underground storage tanks,

[1]Legacy waste is defined as waste generated from past isotope production and research and development activities.

[2]Low-level waste is defined as any radioactive waste not classified as high-level, spent nuclear fuel TRU, byproduct material, or mixed waste [based on Implementation Guide for Use with DOE M 435.1-1, DOE G 435.1-1, July 1999 (DOE 1999a)].

[3]TRU waste is waste not classified as high-level radioactive waste but as waste which contains more than 100 nanocuries per gram (nCi/g) of alpha-emitting TRU isotopes (atomic numbers greater than 92) with half-lives greater than 20 years (based on DOE 1999a).

[4]Mixed waste is a waste that contains radioactive waste regulated under the Atomic Energy Act of 1954 as amended, and a hazardous component subject to the Resource Conservation and Recovery Act (based on DOE 1999a).

[5]Contact-handled TRU waste contains beta- and gamma-emitting isotopes in addition to alpha-emitting isotopes, with a surface dose rate of 200 millirem per hour (mrem/h) or less [*Internal Dose Conversion Factors for Calculation of Dose to the Public*, DOE/EH-0071, July 1998 (DOE 1998a)].

[6]Remote-handled TRU waste contains beta- and gamma-emitting isotopes in addition to alpha-emitting isotopes, with a surface dose rate greater than 200 mrem/h (DOE 1998a).

[7]Alpha low-level radioactive waste is low-level waste that contains alpha-emitting isotopes.

formed from precipitants that settled out of the supernate during waste storage. The sludge waste has been characterized as TRU waste.

The solid waste at ORNL is a heterogeneous mixture consisting of paper, glass, rubber, cloth, plastic, and metal from glove boxes, fuel processing, hot cells, and reactors. Based on generator records, the solid waste has been classified as either TRU or alpha low-level radioactive waste. Because the nature of the solid waste can only be confirmed after retrieval and characterization, solid wastes were characterized as "TRU/alpha low-level radioactive waste" in the Notice of Intent to note the current uncertainty. The solid waste may contain metals regulated under RCRA, but generator records do not indicate the presence of any RCRA-listed constituents.

1.2.2 Waste Storage at ORNL

Approximately 30% of the legacy TRU tank waste is in the form of sludge, which is currently stored in aging, underground storage tanks that are undergoing waste retrieval operations. The retrieved waste is being transferred to the Melton Valley Storage Tanks. The remainder of the TRU sludge waste is already stored in the Melton Valley Storage Tanks. Sampling and analysis has been performed on all of the tank waste at ORNL. The radiological and chemical properties of the sludge and supernate have been measured, and a bounding analysis was performed on each constituent to provide a range of waste characteristics. The legacy TRU solid waste at ORNL is currently stored in subsurface trenches, vaults, and metal buildings.

Approximately 60 m^3 (15,850 gal) of low-level liquid waste and about 20 m^3 (706 ft^3) of TRU waste (5 m^3 of remote-handled TRU solid, 10 m^3 of contact-handled TRU solid, and 5 m^3 of sludge) are generated each year at ORNL. New waste generated after the proposed TRU Waste Treatment Facility is closed and D&D begins is not within the scope of this Environmental Impact Statement (EIS). When the proposed TRU Waste Treatment Facility is closed for decontamination and decommissioning (D&D), DOE plans to treat TRU liquid wastes at the main TRU waste generator facility known at the Radiological Engineering Development Center (REDC) in order to avoid future large inventories of TRU liquid or sludge waste. Newly generated liquid low-level waste would be processed through the ORNL waste management system and stored in the Melton Valley Storage Tanks–Capacity Increase Project tanks (Figure 1-2). Solid TRU waste would be packaged at the generating facility for disposal at the Waste Isolation Pilot Plant.

1.2.2.1 Liquid and sludge wastes storage

The liquid low-level waste system at ORNL includes underground storage tanks for the accumulation of mixed (RCRA and radioactive) TRU and low-level sludges and liquids. The supernate (liquid layer covering the sludge in underground storage tanks) is considered a low-level waste. It does not contain hazardous constituents and is not regulated under RCRA. The sludge developed from particulates settling out of the liquid waste and forming a sludge layer on the tank bottoms. The sludge waste is characterized as TRU waste, and it contains RCRA metals including mercury, chromium, cadmium, and lead.

From 1966 until 1984, the primary method for liquid low-level waste disposition at ORNL was hydrofracture. Hydrofracture involved mixing the waste with grout and injecting the resulting waste slurry into shale formations located more than 1,000 ft below ground. Liquid low-level waste was prepared and disposed of primarily at the Old Hydrofracture Facility. The New Hydrofracture Facility was also used for a short period of time. Since 1984, underground piping has been used to transfer liquid low-level waste to the ORNL evaporator facility for volume reduction. The evaporator bottoms are pumped in shielded, aboveground lines to the Melton Valley Storage Tanks following volume reduction operations.

Wastewater treatment units are specifically excluded from federal RCRA permitting requirements pursuant to 40 *Code of Federal Regulations* (*CFR*) 170.1(c)(2)(v). The Melton Valley Storage Tanks are classified as waste water treatment units under TDEC's administered water program and are subject to ORNL's Tennessee Pollutant Discharge Elimination System Permit (TPDES). The Melton Valley Storage Tanks are also permitted by rule under the State of Tennessee's RCRA program because, under Tennessee rules [TNRule 1200-1-11-.07(1)(c)], TPDES-permitted units are granted permit by rule status. Under the Federal Facilities Agreement (FFA) between the U.S. Environmental Protection Agency (EPA), TDEC, and DOE, the Melton Valley Storage Tanks are classified as existing, in-service tanks with secondary containment.

Under the FFA, these tanks must continue to undergo annual integrity assessments and maintain their release detection monitoring capabilities throughout their active lives. The tanks are allowed to remain in service unless a release is detected. Results of the assessments continue to demonstrate that the Melton Valley Storage Tanks are not releasing hazardous constituents or radionuclides to the environment.

The Melton Valley Storage Tanks facility (Figure 1-2) provides a number of measures to prevent, detect, and minimize potential releases to the environment and groundwater. Each of the eight cylindrical tanks is of 3.7-m (12-ft) diameter and is 18.7 m (61.3 ft) long. The tanks are constructed from welded, 0.5-in.-thick, type 304L stainless steel (SS) that is compatible with the primary components of the waste and provides optimum structural integrity. Type 304L SS is very corrosion resistant to neutral or alkaline oxidizing salts such as nitrates, nitrites, or chromates. The tanks were designed for service pressure of 15 pounds per square inch, gauge (psig) and service temperatures up to 150°F. The tanks were hydrostatically tested at 22.5 psig prior to operation. The tanks are fitted with level switches and specific gravity and temperature elements that are connected to recorders/alarms in the local control house.

Figure 1-2. Aerial view of the Melton Valley Storage Tanks–Capacity Increase Project during installation of the six 100,000-gallon tanks located south of the Melton Valley Storage Tanks.

Two underground concrete vaults provide secondary containment for the Melton Valley Storage Tanks (Figure 1-2). Each vault provides containment for four tanks. Both vaults are 19.5 m (64 ft) wide by 20 m (67 ft) long and have an internal height of 5.8 m (19 ft). The walls, floors, and ceilings of the vaults are constructed from 0.8- to 1.5-m (2.5- to 5.0-ft)-thick reinforced concrete. The vaults are internally lined by a 16-gauge, type 304 SS, welded construction "floor pan" to a height of about 2 m (7 ft). The vaults contain an integral sump pump for the collection and detection of any tank leakage. The vaults meet the requirements for Seismic Zone 2 under the Uniform Building Code (UBC). The tanks' piping, valve, and pump gallery is located in an adjacent, similarly constructed under-ground vault that is internally lined with a type 304 SS floor pan to a height of about 0.9 m (3 ft).

The waste volumes in the Melton Valley Storage Tanks began to approach capacity limits in the early 1990s from the continued generation of liquid low-level waste at ORNL. The Emergency Avoidance Solidification Campaign solidified about 25,000 gal of the supernate layer that had separated from the sludge during storage in an effort to reduce some of the waste volume in the Melton Valley Storage Tanks. ORNL conducted additional volume reduction campaigns and other operations, including in-tank evaporation and out-of-tank evaporation to maintain capacity at the Melton Valley Storage Tanks.

In 1998, ORNL completed the Melton Valley Storage Tanks–Capacity Increase Project, which involved construction of facilities adjacent to the existing Melton Valley Storage Tanks and installation of six 100,000-gal cylindrical, SS storage tanks (Figure 1-2). An Environmental Assessment (EA) was completed for these tanks in 1995 (*Environmental Assessment of the Melton Valley Storage Tanks–Capacity Increase Project*, DOE/EA-1044) (DOE 1995). The new facility has the capability to transfer liquids and pumpable sludges between the six new tanks and the eight original Melton Valley Storage Tanks. Pipes from the new tanks also allow transfers of waste to the liquid low-level waste evaporator and the solidification facility at ORNL. Based on a projected generation rate of approximately 60 m^3/year (15,770 gal/year) of liquid low-level waste from the evaporator bottoms (sludge and supernate), the new tanks will provide sufficient storage capacity for low-level waste for approximately 24 years.

1.2.2.2 Solid waste storage

Solid remote-handled and contact-handled TRU waste is currently packaged in metal boxes, drums, and concrete overpacks, and stored in RCRA-permitted facilities (metal buildings and bunkers). Most of the legacy solid waste containers do not meet the current U.S. Department of Transportation (DOT) regulations and would require repackaging prior to shipment offsite.

Solid TRU waste is also buried in metal and wood boxes found in 27 trenches and 8 auger holes used for the retrievable storage of TRU waste in the Solid Waste Storage Area 5 North (SWSA 5 North). The trenches have seasonal infiltration and inundation of groundwater intermittently throughout the year that causes a "bathtubbing" effect. Soil sampling around the trenches and White Oak Creek indicate gamma contamination at the soil surface equal to 50 μRem/h. These trenches also contribute to surface water and groundwater contamination in the Melton Valley Watershed. The primary contamination sources in the SWSA 5 North area are soils and sediments found on 1.54 ha (3.8 acres). The primary source volume is 1.1 million cubic feet (ft^3) of waste, soils, and sediment containing a total of 14,000 curies. Secondary contamination of soil and groundwater ocurrs on 1.54 ha (3.8 acres). The secondary contamination media include contaminated soils and groundwater between the TRU trenches and White Oak Creek. The SWSA 5 North trenches are estimated to contribute to 6% of the total strontium-90 and 3.6% of the cesium-137 released to surface water in Melton Valley [*Remedial Investigation Report on the Melton Valley Watershed at Oak Ridge National Laboratory, Oak Ridge, Tennessee, Volume 1. Evaluation, Interpretation, and Data Summary*, DOE/OR/01-1576/V1&D2, May 1997 (DOE 1997a)].

1.3 PURPOSE AND NEED FOR DOE ACTION

DOE has a need to treat the legacy TRU waste at ORNL in order to reduce the risk to human health and the environment and to comply with legal mandates from the TDEC and the ORNL Site Treatment Plan. The four types of legacy TRU waste that require treatment at ORNL are: remote-handled TRU waste sludge; low-level radioactive waste supernate associated with the sludge; contact-handled TRU/alpha low-level radioactive waste solids; and remote-handled TRU/alpha low-level radioactive waste solids. The approximate quantities of the four waste streams requiring treatment and analyzed in this EIS are:

- 900 m^3 (31,784.4 ft^3) of remote-handled TRU sludge (mixed waste), which is or will be located in the Melton Valley Storage Tanks;
- 1,600 m^3 (56,505.6 ft^3) of low-level supernate, which is or will be (associated with the TRU sludge) located in the Melton Valley Storage Tanks;
- 550 m^3 (19,423.8 ft^3) of remote-handled TRU waste/alpha low-level radioactive waste solids, located in vaults and trenches; and
- 1,000 m^3 (35,316 ft^3) of contact-handled TRU waste/alpha low-level radioactive waste solids, located in metal buildings.

Due to the water-rich environment in East Tennessee, legacy TRU waste contained in underground trenches at ORNL poses a risk to the area's water quality. Waste retrieval operations are currently under way to prepare many of the TRU waste storage tanks in the Bethel Valley area of ORNL for closure. The wastes retrieved from the tanks in Bethel Valley are being consolidated into the Melton Valley Storage Tanks prior to treatment at the proposed TRU Waste Treatment Facility. DOE will ensure the safe and efficient retrieval, and transfer, of legacy TRU tank waste to the Melton Valley Storage Tanks at ORNL for consolidation. Following the waste treatment and packaging operations, DOE will certify the TRU waste for shipment and disposal at the Waste Isolation Pilot Plant.

There are legal mandates that require DOE to address legacy TRU waste management needs. DOE has been directed by the TDEC and the EPA to address environmental issues including disposal of its legacy TRU waste. DOE is under a TDEC Commissioner's Order (September 1995) to implement the Site Treatment Plan (under the Federal Facility Compliance Act) that mandates specific requirements for the treatment and disposal of ORNL's TRU waste. The primary milestone in the Commissioner's Order is that DOE begin treating legacy TRU sludge in order to make the first shipment to the Waste Isolation Pilot Plant (a DOE transuranic waste disposal facility) in New Mexico by January 2003.

Removal, treatment, and disposal of the retrievable TRU waste from portions of the SWSA 5 North area is considered a major component of the selected remedy for the Melton Valley Watershed at ORNL according to the Record of Decision for the Melton Valley Watershed (DOE 1997b). In addition, two Interim Records of Decision [issued in connection with the FFA among EPA, TDEC, and DOE under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)] require the waste from the Gunite and Associated Tanks Remediation Project (DOE 1997c) and the Old Hydrofracture Facility Tanks Remediation Project (DOE 1997d) to be treated and disposed of along with the TRU waste from the Melton Valley Storage Tanks. This tank waste is included in the total waste volume slated for treatment in the TRU Waste Treatment Project. Currently, no facilities exist at ORNL or the ORR for treating TRU sludges and the associated low-level waste supernate, or the contact-handled and remote-handled TRU/alpha low-level radioactive solid waste.

Low-level radioactive waste must be certified by DOE for shipment and disposal at the DOE site(s) selected in a Record of Decision for the *Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste* (WM PEIS), DOE/EIS-0200-F, May 1997 (DOE 1997e). Disposal of this waste will be consistent with the WM PEIS for low-level waste (e.g., the Nevada Test Site or another designated disposal facility).

1.4 SCOPE OF ENVIRONMENTAL IMPACT STATEMENT

DOE has prepared this EIS under the National Environmental Policy Act (NEPA) and its implementing regulations on the proposed construction, operation, and D&D of a TRU Waste Treatment Facility at ORNL in Oak Ridge, Tennessee. As part of this EIS, DOE will evaluate alternative approaches for achieving the proposed action. Since much of the tank sludge waste displays RCRA characteristics, the proposed facility would be permitted under RCRA. Most of the waste is currently stored in the Melton Valley area of ORNL in underground waste storage tanks, bunkers, metal buildings, and subsurface trenches.

This EIS is being prepared according to the NEPA of 1969, the Council on Environmental Quality NEPA regulations (40 *CFR* 1500–1508), and DOE's NEPA Implementing Procedures (10 *CFR* Part 1021). In accordance with the NEPA process, a Notice of Intent was published in the *Federal Register* (Appendix A.1). This draft EIS incorporates pertinent analyses performed as part of the DOE's *Waste Isolation Pilot Plant Disposal Phase Supplemental Environmental Impact Statement* (WIPP SEIS-II), DOE/EIS-0026-S-2, September 1997 (DOE 1997f) and the WM PEIS. Treatment of ORNL TRU waste onsite, and disposal at the Waste Isolation Pilot Plant, is consistent with the Records of Decision issued for management of the transuranic waste for the aforementioned EISs (63 *FR* 3624 and 3629, respectively, January 23, 1998) (DOE 1998b; DOE 1998c). The disposal of low-level radioactive waste included in the scope of this draft EIS will be consistent with the WM PEIS Record of Decision for low-level waste that has yet to be issued (e.g., Nevada Test Site or another designated disposal facility).

DOE addressed issues associated with the potential environmental impacts of the alternatives for the proposed action in this draft EIS, including:

- potential effects on air, soil, and water quality from normal operations and reasonably foreseeable accidents;
- potential effects on the public, including minority and low-income populations, and workers from exposure to radiological and hazardous materials from normal operations and reasonably foreseeable accidents;
- compliance with applicable federal, state, and local requirements and agreements;
- pollution prevention, waste minimization, and energy and water use reduction technologies to eliminate or reduce use of energy, water, and hazardous substances and to minimize environmental impacts;
- potential socioeconomic impacts, including potential impacts associated with the workforce needed for operations;
- potential cumulative environmental impacts of past, present, and reasonably foreseeable future operations; and
- potential irreversible and irretrievable commitment of resources.

1.5 PUBLIC SCOPING AND PARTICIPATION

Figure 1-3. Stakeholder meetings have been held as part of the TRU Waste Treatment Project.

A Notice of Intent to prepare an EIS for the TRU Waste Treatment Project was published in the *Federal Register* on January 27, 1999. The Notice of Intent identified the public scoping period to encourage early public involvement in the EIS process and to solicit public comments (Figure 1-3) on the proposed scope of the EIS, including the issues and alternatives it would analyze. Two meetings were held in Oak Ridge, Tennessee, on February 11 and 16, 1999, to provide an opportunity for all people who wished to comment or make a presentation. Comment cards were available for those who preferred to submit written comments. Individuals made various comments at the two public scoping meetings, which were formally documented in transcripts. These transcripts were reviewed and summarized in Appendix A.3 that was utilized to address the public comments in this EIS. Most of the comments requested clarification of the proposed action and the alternatives. There was some concern expressed about the High Flux Isotope Reactor access road and the construction of the facility having an impact on the Old Hydrofracture Facility wells, but these wells are located away from these areas and would not be disturbed during any construction activities. The scoping period ended on February 26, 1999.

Project-related and other environmental materials are available for public review in the following reading rooms:

Washington, D.C.	U.S. Department of Energy Freedom of Information Public Reading Room, Forrestal Building, Room I E-190, 1000 Independence Avenue, S.W. Washington, DC 20585 Telephone: (202) 586-3142
Oak Ridge, Tennessee	U.S. Department of Energy, Oak Ridge Operations Office 200 Administration Road, Room G-217 Oak Ridge, TN 37831 Telephone: (423) 241-4780

1.6 RELATIONSHIP TO OTHER NEPA DOCUMENTS

DOE has prepared and issued a number of EISs and EAs that present analysis of environmental consequences that are relevant to the proposed action. These include:

- *Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste*, DOE/EIS-0200-F, May 1997 (DOE 1997e). Low-level radioactive waste must be certified by DOE for shipment and disposal at the DOE site(s) selected in a Record of Decision for low-level and mixed waste under the WM PEIS, which has not yet been issued. In addition, the treatment of TRU waste onsite at ORNL is consistent with DOE's January 1998 WM PEIS Record of Decision for TRU waste treatment and storage, which decided that DOE sites would treat and store their own TRU waste onsite, before shipment to WIPP for disposal.

- *Waste Isolation Pilot Plant Disposal Phase Supplemental Environmental Impact Statement*, DOE/EIS-0026-S-2, September 1997 (DOE 1997f). The WIPP SEIS-II evaluates the impacts of various treatment options; the transportation of TRU waste to the Waste Isolation Pilot Plant, using trucks, and both regular and dedicated rail service; and the disposal of the waste at the Waste Isolation Pilot Plant. The Waste Isolation Pilot Plant has waste acceptance criteria that Oak Ridge TRU waste must meet following treatment.

- *Advanced Mixed Waste Treatment Project at the Idaho National Engineering and Environmental Laboratory Environmental Impact Statement (AMWTP EIS)*, DOE/EIS-0290-F, issued in January 1999 (DOE 1999a). This EIS analyzes the environmental impacts of several similar treatment alternatives and the construction of the Advanced Mixed Waste Treatment Facility in Idaho.

- *Final Environmental Impact Statement for the Construction and Operation of the Spallation Neutron Source*, DOE/EIS-0247, April 1999 (DOE 1999b). This document addresses the regional environment on the ORR.

1.7 REFERENCES

DOE (U.S. Department of Energy) 1995. *Environmental Assessment of the Melton Valley Storage Tanks–Capacity Increase Project*, DOE/EA-1044, U.S. Department of Energy, Washington, D.C.

DOE 1997a. *Remedial Investigation Report on the Melton Valley Watershed at Oak Ridge National Laboratory, Oak Ridge, Tennessee, Volume 1. Evaluation, Interpretation, and Data Summary*, DOE/OR/01-1576/V1&D2, May 1997.

DOE 1997b. *Record of Decision for the Melton Valley Watershed at Oak Ridge National Laboratory, Oak Ridge, Tennessee*, DOE/OR/01-1826&D1.

DOE 1997c. *Record of Decision for Interim Action: Sludge Removal from the Gunite and Associated Tanks Operable Unit, Waste Area Grouping 1, Oak Ridge National Laboratory, Oak Ridge, Tennessee*, DOE/OR/OR2-1591&D3, August 1997.

DOE 1997d. *Action Memorandum for the Old Hydrofracture Facility Tanks and Impoundment, Oak Ridge National Laboratory, Oak Ridge, Tennessee*, DOE/OR/01-1751&D3.

DOE 1997e. *Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste*, DOE/EIS-0200-F, U.S. Department of Energy, Washington, D.C., May 1997.

DOE 1997f. *Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement*, DOE/EIS-0026-s-2, U.S. Department of Energy, Washington, D.C., September 1997.

DOE 1998a. *Internal Dose Conversion Factors for Calculation of Dose tot he Public*, DOE/EH-071, July 1998.

DOE 1998b. *WIPP SEIS-II, Record of Decision for the Department of Energy's Waste Isolation Pilot Plant Disposal Phase, Federal Register*, Vol. 63, No. 15, January 23, 1998, pages 3624–3629.

DOE 1998c. *WM PEIS, Record of Decision for the Department of Energy's Waste Management Program: Treatment and Storage of Transuranic Waste, Federal Register*, Vol. 63, No. 15, January 23, 1998, pages 3629–3633.

DOE 1999a. *Implementation Guide for Use with DOE M 435.1-1*, DOE G 435.1-1, July 1999.

DOE 1999b. *Advanced Mixed Waste Treatment Project Final Environmental Impact Statement*, DOE/EIS-0290, U.S. Department of Energy, Idaho National Engineering and Environmental Laboratory, Idaho Falls, Idaho, January 1999.

DOE 1999c. *Final Environmental Impact Statement for the Construction and Operation of the Spallation Neutron Source*, DOE/EIS-0247, U.S. Department of Energy, Office of Science, Washington, D.C., April 1999.